ADVANCES IN RISK MANAGEMENT

Also edited by Greg N. Gregoriou

ASSET ALLOCATION AND INTERNATIONAL INVESTMENTS
DIVERSIFICATION AND PORTFOLIO MANAGEMENT OF MUTUAL FUNDS
PERFORMANCE OF MUTUAL FUNDS

Advances in Risk Management

Edited by

GREG N. GREGORIOU

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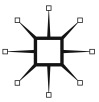

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Introduction

Chapter 1 examines the estimation of operational risk exposure of financial institutions, and its dependence on the floor level at which operational losses are collected. The chapter shows that the choice of the collection threshold is not likely to influence the economic capital if extreme loss events are properly accounted for. Overall, the choice of the collection threshold should rather be guided by a simple profit/cost analysis than by regulatory arbitrage considerations.

Chapter 2 introduces a risk measure defined on portfolio holdings. In contrast to terminal portfolio values, this domain is conducive to having diversification reduce portfolio risk. The risk of a portfolio is determined by its distance from a set of acceptable portfolios. More importantly, this distance involves as many components as there are available assets, which includes but is not limited to risk-free capital. As a consequence, the role of derivative as well as insurance contracts in risk management is recognized.

Chapter 3 looks at the sensitivity analysis of volatility and return models that can be thought of as an essential ingredient in portfolio management. The Differential Importance Measure (DIM) is a generalization of local sensitivity analysis techniques and provides insights for the analysis of the impact of parameter changes. By considering a portfolio GARCH model, we make use of the DIM to identify the most important stocks in a given portfolio, i.e. those stocks whose change is meant to generate substantial changes in the portfolio return volatility. In order to provide some empirical application of the proposed technique, we consider a portfolio of 30 stocks, replicating the Dow Jones Index composition as at 2002.

Chapter 4 presents several applications of a two-factor continuous-time model of the term structure of interest rates, previously presented in Moreno (2003), for managing interest rate risk. New measures that generalize conventional duration and convexity are presented and applied in different

situations to manage market and yield curve risks. After showing how to immunize a bond portfolio with bond options, the authors present and illustrate numerically how these new measures can solve the limitations of conventional duration.

Chapter 5 reviews the recent literature about stochastic volatility and builds on the works of Nelson which reconcile continuous and discrete volatility processes. The authors use the Extended Kalman Filter to deal with the issue of the unobserved volatility of the yield curve. The authors also introduce Bollinger bands as a brand-new variance reduction technique for improving the Monte Carlo performance; a technique never applied before to yield curve forecasting.

Chapter 6 examines the modern credit risk valuation which focuses on the soundness of the risk assessment process since Basel II directives. Any risk assessment requires comprehending the volatility of credit risky assets with accuracy. For this purpose, the authors state a flexible credit risk valuation framework while allowing such a volatility to evolve stochastically. Hence, the structural approach of credit risk along with the modern option pricing theory allows for an interesting and flexible stochastic credit risk valuation framework.

Chapter 7 investigates simple intensity models that induce dependence levels comparable to those induced by a Merton-style model using a simulation model. The authors compare the respective loss distributions obtained in each framework and provide some dependence indicators. Moreover, they specify two promising and original intensity-based models that emphasize their results: correlated frailty and alpha-stable distributions.

Chapter 8 discusses various mathematical techniques that can be used for the modelling of weather derivatives portfolios. In particular, the authors describe extensions to the most commonly used simulation algorithm. These extensions include methods that improve estimates of the correlation structure, deal with non-normality, incorporate hedging constraints, estimate sampling error, allow consistency between single contract pricing and portfolio modeling, and give quick estimates of VaR.

Chapter 9 links nominal interest payments (as in typical bond contracts) with the demand for real payments (as in pension contracts), and models for the inflation and for valuing inflation linked products. Here, the authors introduce a simple continuous-time framework that is economically justified and similar to the Garman–Kohlhagen model for foreign currencies. It allows for valuation of inflation-linked derivatives, optimal investment into such products and hedging of inflation risk. Explicit solutions for all these tasks are provided and permit an easy implementation and calibration in real world markets.

Chapter 10 examines the explosive growth in the use of financial models in recent years that has allowed for the creation of more diverse financial products and the development of new markets for such products. However,

it also has some drawbacks, such as the creation of a new type of risk called model risk. The latter arises as a consequence of incorrect modelling, model identification or specification errors, inadequate estimation procedures, as well as mathematical and statistical properties of financial models applied in imperfect financial markets. Although models vary in their sophistication, they all need to be subjected to an effective validation process to minimize the risk of model errors.

Chapter 11 investgates the crucial question among risk managers and regulators; whether Value-at-Risk models are accurate enough. The authors propose a methodology based on a cross-section analysis of portfolios, aimed to assess the goodness of VaR using a simultaneous analysis of a multitude of simulated portfolios, created starting from a common investment universe. This enhances the exploitation of the information content of data, broadening the perspective of risk assessment.

Chapter 12 analyses the shocks in correlations that could significantly alter outcomes in portfolio optimization and risk management estimates. The chapter examines the relation between exponential correlation changes and volatility for the different movements of markets and studies the magnitude of errors among equity investments in the USA, the Euro area and Japanese markets.

Chapter 13 explores the historical values of the asset returns process, from which is derived the sequential control procedures for monitoring the changes in the covariance matrix of asset returns that could influence the selection of an optimal portfolio. In order to reduce the dimensionality of the control problem we focus essentially on the transformation of the optimal portfolio weights vector.

Chapter 14 reiterates the notion whereby one of the factors that contributes to the portfolio diversification benefit is the correlation between the asset returns. Correlations are time varying and the traditional method of using unconditional correlations in portfolio optimization models may not capture the time-varying nature of asset return correlations. In this chapter the authors compare the *ex post* performance of portfolios created using unconditional correlations against those created using Dynamic Conditional Correlation (DCC). The results using 20 stocks from the Dow Jones Industrial Average show that portfolios created using the DCC model outperformed those created using the unconditional correlations.

Chapter 15 deals with the evaluation of risky capital investment projects when total risk is relevant. The authors demonstrate mathematically that the NPV probability distribution does not conform strictly to the central limit theorem asymptotic properties, whereas first-order autoregressive stochastic stationary processes do. However, through simulation runs and statistical tests, the authors show under realistic conditions that the CLT does apply to the NPV probability distribution provided the discount rate does not exceed some threshold value.

Chapter 16 analyses the volatility transmission between the US and Spanish stock markets using a recent sample period including September 11. The analysis is based on a multivariate GARCH model which takes into account both the asymmetric volatility phenomenon and the non-synchronous trading problem. An examination of Asymmetric Volatility Impulse-Response Functions (AVIRF) confirms that volatility transmission patterns between both markets have changed as a result of the terrorist attacks.

Chapter 17 examines the volatility transmission between large and small firms in Europe using Germany, France and UK stockmarket data. The empirical results indicate that volatility spillovers take place between both kinds of firms and that the volatility feedback hypothesis can explain asymmetric volatility and covariance. Additionally, evidence is obtained showing that in order to avoid error specification in the beta coefficient, it is necessary to use a conditional model.

Chapter 18 analyzes the impact of model misspecification on the replication error associated with trading contingent claims in arbitrage free markets. A general formula is determined for the total hedging error in the light of stochastic volatility and numerical tests are performed on European options to estimate the replication error probability density function.